

a conveying apparatus conveying said wafer adjacent said voltage sensor of the head assembly.

RESPONSE

The Office Action has been carefully considered and the foregoing amendments and following remarks are made in response thereto. Claims 53-57 are pending in the application. Claims 53-57 are rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent Number 5,091,691 to Kamieniecki ("Kamieniecki"). In view of the amendments and following remarks, allowance of claims 53-57 is respectfully requested.

1. The drawings have been objected to under 37 CFR 1.83(a). The Office Action states "[t]he drawings must show every feature of the invention specified in the claims. Therefore, a first surface and a second surface [claim 1] must be shown or the feature(s) canceled from the claim(s)."

In response, Applicants have submitted a corrected drawing for FIG. 1. Also submitted is a marked up version of FIG. 1 that was previously filed, which shows the changes to FIG. 1 in red ink. In FIG. 1 reference numbers 28A and 28B have been added. Applicants have also amended the specification at the first paragraph on page 10, to include reference numbers 28A and 28B by adding the text of "having a first surface 28A and a second surface 28B." No new matter has been added. Applicants submit that the corrected drawing and amendment to the specification obviates this rejection.

2. Claims 53-57 were rejected under 35 U.S.C. §102(b) as being anticipated by Kamieniecki. The Office Action states "[r]egarding claim 53, Kamieniecki discloses [see Fig. 17] an apparatus for making surface photovoltage measurements of a semiconductor comprising a sealed chamber (represented as enclosure 197) [see column 12 lines 15-19] for processing the semiconductor wafer (represented as specimen 11) [see column 4 lines 34-37 and column 6 lines 32-36] having a first surface and a second surface [see Fig. 17] and a head assembly (represented as arrangement 191) having a modulated light source (43) exposing [via glass plate 201] at least a portion of the semiconductor wafer (11) to light having a wavelength and modulated at a frequency [see column 7 lines 29-35 and lines 49-62 and column 12 lines 39-42] and a surface photovoltage sensor (represented as reference electrode assembly 199) comprising a plurality of

electrodes (transparent plate 201, edge pickup areas 205, 207, and 209 and central pickup area 203) positioned adjacent the first surface [see Fig. 17] to detect a surface photovoltage [see Abstract lines 6-8] induced at the first surface of the semiconductor wafer (11) in response to the light [via light source 43] without contacting the wafer (11) [see column 12 lines 39-50], the plurality of electrodes (201, 203, 205, 207 and 209) sufficient for detecting the surface photovoltage on the first surface and the surface photo-voltage sensor (199) of head assembly (191) located within the sealed chamber (197). Regarding claims 54-56 Kamieniecki discloses the sealed chamber (197) as a reduced pressure chamber, a chemically reactive gas chamber or an inert environmental chamber [see column 12 lines 15-16 and column 13 lines 42-46]. Regarding claim 57, Kamieniecki discloses [see fig. 17] the head assembly (191) is entirely located within the sealed chamber (191)."

For the rejection under 35 U.S.C. §102 to be proper, the prior art reference must disclose all of the claim limitations. Applicant respectfully submits that Kamieniecki does not disclose every claim element of the claimed invention as presently amended. Applicant has amended claim 53 to include the limitation of "a conveying apparatus conveying said wafer adjacent said voltage sensor of the head assembly." Support for the amended claim can be found at least on page 10 lines 5-9 of the specification. No new matter has been added.

The present invention relates to a wafer fabrication system. The claimed invention includes a sealed chamber for processing a semiconductor wafer having a first surface and a second surface. The claimed invention further includes a head assembly, which has a modulated light source exposing at least a portion of the semiconductor wafer to light having a wavelength and modulated at a frequency. The head assembly further includes a surface photovoltage sensor, located within the sealed chamber, which has a plurality of electrodes positioned adjacent the first surface to detect a surface photovoltage induced at the first surface of the semiconductor wafer in response to the light without contacting the wafer. The plurality of electrodes are sufficient for detecting the surface photovoltage on the first wafer. The invention further includes a conveying apparatus for conveying the wafer adjacent the voltage sensor of the head assembly. Amended claim 53 now includes a conveying apparatus.

In contrast, while Kamieniecki disclosed an apparatus for measuring surface photovoltage, Kamieniecki does not disclose a conveying apparatus for conveying the wafer adjacent the voltage sensor of the head assembly.

Claim 53 has been amended as to include a conveying apparatus for conveying the wafer adjacent the voltage sensor of the head assembly. Applicants submit that claim 53 as amended is allowable and request early favorable action by the Examiner. Applicants further submit that claims 54-57 are also allowable as depending from an allowable base claim.

Reconsideration and withdrawal of the rejection of claims 53-57 under 35 U.S.C. §102(b) as being anticipated by Kamieniecki is respectfully requested.

3. As the Examiner has recognized, none of U.S. Patent No. 5,442,297 to Verkuil, U.S. Patent No. 5,650,731 to Fung et al, U.S. Patent No. 5,708,365 to Yoshino et al, U.S. Patent Nos. 6,034,535 and 6,097,205 to Liberman et al, U.S. Patent No. 6,060,709 to Verkuil et al, U.S. Patent No. 6,163,163 to Kohn et al, and U.S. Patent Nos. 6,315,574 and 6,388,455 to Kamieniecki et al, anticipate or render obvious Applicant's claimed invention, either alone or in combination with the art of record.

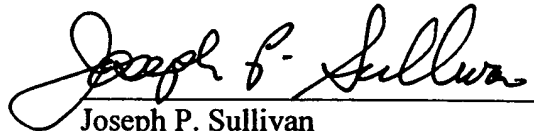
CONCLUSION

Applicant respectfully requests entry of this amendment and response, withdrawal of all bases of rejection, and allowance of claims 53-57 in due course. The Examiner is invited to telephone Applicant's under signed representative at (617) 248-7677 to discuss any outstanding issues.

Respectfully submitted,

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MARKED-UP COPY OF AMENDMENTS TO THE SPECIFICATION

The paragraph starting on page 10, line 1 of the specification has been amended as follows:

In brief overview, and referring to FIG. 1, an embodiment of such an apparatus 10 for the real-time, in-line electrical characterization of a semiconductor during manufacturing using induced surface photovoltage includes a sensor head assembly 14, supporting electronics 18, and a wafer conveying device 22. In operation, the wafer conveying device 22, such as a conveyor belt, a robotic arm, a wafer chuck or similar device, moves the wafers 28, 28', having a first surface 28A and a second surface 28B, through the manufacturing process and, in one embodiment, beneath the sensor head assembly 14.

MARKED-UP COPY OF AMENDMENTS TO THE CLAIMS

53. (Thrice Amended) A semiconductor wafer fabrication system comprising:

a sealed chamber for processing said semiconductor wafer having a first surface and a second surface; and a head assembly comprising:

a modulated light source exposing at least a portion of said semiconductor wafer to light having a wavelength and modulated at a frequency;

a surface photovoltage sensor comprising a plurality of electrodes positioned adjacent said first surface to detect a surface photovoltage induced at said first surface of said semiconductor wafer in response to said light without contacting said wafer, said plurality of electrodes sufficient for detecting said surface photovoltage on said first surface; ~~and~~

said surface photovoltage sensor of said head assembly located within said sealed chamber; and

a conveying apparatus conveying said wafer adjacent said voltage sensor of the head assembly.